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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/686,849	10/16/2003	Anton Mauder	MUH-12841	1748
24131	7590	05/12/2005	EXAMINER	
LERNER AND GREENBERG, PA			PHAM, LONG	
P O BOX 2480			ART UNIT	PAPER NUMBER
HOLLYWOOD, FL 33022-2480			2814	

DATE MAILED: 05/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/686,849

Applicant(s)

MAUDER ET AL. 

Examiner

Long Pham

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. §. 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 24-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/16/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-23 in the reply filed on 02/22/05 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (US patent 6,440,828) in combination with Cheng et al. (US patent 5,873,984), Kobayashi et al. (US 5,631,189), and Slater, Jr et al.

With respect to claims 1 and 2, Sato et al. teach a contact configuration, comprising (see the abstract and claims 1-8):

a semiconductor body of monocrystalline silicon;

a refractory metal layer; and

a layer of amorphous silicon disposed between the semiconductor body and the refractory metal, for forming an ohmic contact between the refractory metal layer and the semiconductor body.

With respect to claim 3, Sato et al. appear to fail to teach doping the amorphous silicon with hydrogen.

Cheng et al. teach doping amorphous silicon with hydrogen to improve mechanical property. See col. 2, lines 25-30.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to dope the amorphous silicon of Sato et al. with hydrogen to obtain the above advantage.

Sato et al. appear to fail to teach doping the amorphous silicon with oxygen.

Kobayshi et al. teach doping amorphous silicon with oxygen to increase oxidation rate. See col. 7, lines 25-30.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to dope the amorphous silicon of Sato et al. with oxygen to obtain the above advantage.

With respect to claims 5 and 8, Sato et al. further teach the semiconductor body is a n or p type conductive region. See col. 7, lines 1-10.

With respect to claim 6, the doping of phosphorus into amorphous silicon is well-known.

With respect to claim 7, the doping of boron into amorphous silicon is well-known.

With respect to claim 12, the use of aluminum, chromium, or aluminum/chromium in forming ohmic contact is well-known.

With respect to claims 13 and 14, the incorporation of trench component comprising of diode, bipolar transistor, MOSFET, and IGBT is well-known.

With respect 15, Sato et al. further teach a field stop zone in the semiconductor body adjoining the layer of amorphous silicon. See the abstract.

With respect to claims 16, 17, and 18, the incorporation of an emitter which has the same or opposite conductivity type as the semiconductor body for forming IGBT is well-known. Further, the formation of an ohmic contact in the area of an emitter of IGBT is well-known.

With respect to claim 19, it is submitted that if an emitter is incorporated into the semiconductor body of Sato et al. the emitter would inherently form

a schottky or ohmic contact with high contact resistance in the absence of the amorphous silicon layer.

With respect to claim 20, the formation of ohmic contact in rear or front of a semiconductor body is well-known.

With respect to claim 21, it is submitted that since Sato et al. teach an ohmic contact having an amorphous silicon layer, the injection of charge carriers would inherently attenuate.

With respect to claim 22, the crystallization of amorphous silicon is well-known.

With respect to claims 9 and 10, Sato et al. fail to teach the range for the thickness of the amorphous silicon layer.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the thickness of the amorphous silicon layer through routine experimentation and optimization to obtain optimal or desired device performance because the thickness of the amorphous silicon layer is a result-effective variable and there is no evidence indicating that it is critical or produces any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to claim 11, Sato et al. fail to teach the range for the concentration of the amorphous silicon layer.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the concentration of the amorphous silicon layer through routine experimentation and optimization to obtain optimal or desired device performance because the concentration of the amorphous silicon layer is a result-effective variable and there

is no evidence indicating that it is critical or produces any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to claim 23, Sato et al. fail to teach that the layer formed between the metal layer and semiconductor is made of silicon carbide.

Slater, jr et al. teach forming a silicon carbide between a silicon carbide substrate and a metal layer to obtain an ohmic contact which is economic to make. See claim 1 and [0016].

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to replace amorphous silicon with silicon carbide to achieve the above advantage.

Conclusion

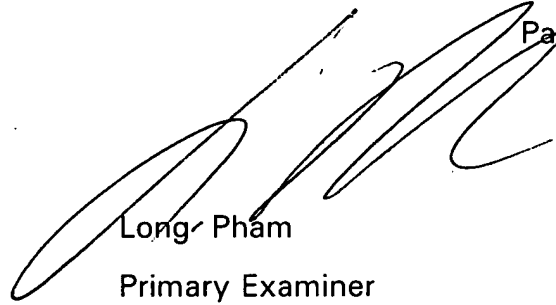
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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A handwritten signature in black ink, consisting of several loops and a long horizontal stroke, positioned above the printed name.

Long Pham

Primary Examiner

Art Unit 2814

LP